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MANAGEMENT

10 May 1976

ATTACHMENT A

GUIDANCE ON IMPLEMENTATION OF THE INTERNATIONAL SYSTEM OF UNITS IN INTELLIGENCE COMMUNITY REPORTING

1. On 14 March 1974 all United States Intelligence Board members concurred in the February 1974 USIB Metric Panel report recommending that the Intelligence Community prepare to use the International System of Units (commonly referred to as metric or SI) for intelligence reporting immediately after enactment of the metric conversion legislation. On 23 December 1975 the President signed the "Metric Conversion Act of 1975", P.L. 94-168 which commits the United States "to coordinate and plan the increased use of the metric system in the United States".

2. The USIB Metric Panel's report calls for each member of the Intelligence Community to begin a two-month familiarization and training phase after enactment of legislation. The Panel now recommends that completion of this phase be extended to 15 May 1976. The second phase for the Intelligence Community provides for a period of dual reporting -- both in metric and customary units -- that will last a maximum of eighteen months. Within CIA the period of dual reporting will last six months, beginning 17 May 1976 and terminating on 19 November 1976. Thereafter intelligence reports will contain only metric units of measure. Those components already using a dual method or metric unit for reporting should continue to do so.

3. The Intelligence Community will make a number of exceptions in the use of pure metric units. The exceptions are those listed in Table 6 on the attached page from the Federal Register of 19 June 1975 (V. 40, No. 119, p. 25837). The most common of the excepted units are time measurements (day, hour, minute, and second), navigational units (degree, minute, and second), the liter, the metric ton, the nautical mile, and the knot. There are three exceptions in addition to those listed in the attachment. First, the term "barrels" (and barrels per day) will continue to be used when reporting on the petroleum industry. Second, the term "U.S. bushel" will continue to be used when reporting on grain production and trade. Third, the term "tons" will continue to be used by the Intelligence Community in its nuclear reporting rather than the metric term "joules".

4. Some raw reporting in the Intelligence Community has contained units that are neither metric nor customary; such units will be converted directly into metric units as recommended in the United Nations document entitled "World Weights and Measures (Handbook for Statisticians)". Copies of this book may be ordered from the Central Reference Service, Acquisition Branch, Room GE-47 Headquarters Building, extension

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5. The Agency has obtained an excellent self-teaching text, "Thinking Metric" by Thomas F. Gilbert, which provides a thorough familiarization with the international system of units and with the process of conversion from conventional U.S. units of measure to metric units. Copies of this text may be obtained from the Central Reference Service, Acquisition Branch. No formal training program has been planned in the Agency and each directorate has indicated that it would individually arrange whatever training might be required for its members.

6. Conversion of large central files of data from the traditional to international system of units will be planned and begun on a systematic basis during the period of dual reporting. The specific date for the completion of such conversion has not been established. Completion of file conversion may be expected to take several years.

7. Questions regarding use of the metric system should be directed to one of the following:

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FOR THE DIRECTOR OF CENTRAL INTELLIGENCE:

JOHN F. BLAKE
Deputy Director
for
Administration

Attachment

DISTRIBUTION: ALL EMPLOYEES (1-6)

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National Bureau of Standards

METRIC SYSTEM OF WEIGHTS AND MEASURES

Guidelines for Use

Section 403 of Pub. L. 93-380 states the policy of the United States to encourage educational agencies and institutions to prepare students to use the metric system of measurement as part of the regular education program and authorizes the U.S. Commissioner of Education to carry out a program of grants and contracts to fulfill this policy. Subsection 403 (a) (3) states, "For the purposes of this section, the term 'metric system of measurement' means the International System of Units as established by the General Conference of Weights and Measures in 1960 and interpreted or modified for the United States by the Secretary of Commerce." The National Bureau of Standards is responsible for "the custody, maintenance, and development of the national standards of measurement" (15 U.S.C. 272), and the Secretary has designated NBS to implement his responsibilities under subsection 403(a)(3). Pursuant to his authority under section 403, the U.S. Commissioner of Education has requested that NBS publish guidelines for use of the International System of Units, as interpreted and modified for the United States. Accordingly, and in implementation of the Secretary's responsibilities under subsection 403(a)(3), the following tables and associated materials set forth guidelines for use of the International System of Units (hereinafter "SI"), as interpreted and modified for the United States by NBS on behalf of the Secretary of Commerce.

The SI is constructed from seven base units for independent quantities plus two supplementary units for plane angle and solid angle, listed in Table 1.

TABLE 1

Quantity	Name	Symbol
SI BASE UNITS		
length	metre (meter)[1]	m
mass [2]	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature. [3]	kelvin	K
amount of substance	mole	mol
luminous intensity	candela	cd
SI SUPPLEMENTARY UNITS		
plane angle	radian	rad
solid angle	steradian	sr

[1] Both spellings are acceptable.
[2] "Weight" is the commonly used term for "mass."
[3] It is acceptable to use the Celsius temperature (symbol t) defined by $t = T - T_0$ where T is the thermodynamic temperature, expressed in kelvins, and $T_0 = 273.15$ K by definition. The unit "degree Celsius" is thus equal to the unit "kelvin" when used as an interval or difference of temperature. Celsius temperature is expressed in degrees Celsius (symbol °C).

Units for all other quantities are derived from these nine units. In Table 2 are listed 17 SI derived units with special names which were derived from the base and supplementary units in a coherent manner, which means in brief, that they are expressed as products and ratios of the nine base and supplementary units without numerical factors.

TABLE 2.—*SI derived units with special names*

Quantity	SI unit: Name	SI unit: Symbol	SI unit: Expression in terms of other units
frequency	hertz	Hz	s^{-1}
force	newton	N	$m \cdot kg/s^2$
pressure, stress	pascal	Pa	N/m^2
energy, work, quantity of heat.	joule	J	$N \cdot m$
power, radiant flux	watt	W	J/s
quantity of electricity, electric charge.	coulomb	C	$A \cdot s$
electric potential, potential difference, electromotive force.	volt	V	W/A
capacitance	farad	F	C/V
electric resistance	ohm	Ω	V/A
conductance	siemens	S	A/V
magnetic flux	weber	Wb	$V \cdot s$
magnetic flux density.	tesla	T	Wb/m^2
inductance	henry	H	Wb/A
luminous flux	lumen	lm	$cd \cdot sr$
illuminance	lux	lx	lm/m^2
activity (radioactive).	becquerel	Bq	s^{-1}
absorbed dose	gray	Gy	J/kg

All other SI derived units, such as those in tables 3 and 4, are similarly derived in a coherent manner from the 26 base, supplementary, and special-name SI units.

TABLE 3.—*Examples of SI derived units, expressed in terms of base units*

Quantity	SI unit	Unit symbol
area	square metre	m^2
volume	cubic metre	m^3
speed, velocity	metre per second	m/s
acceleration	metre per second squared.	m/s^2
wave number	1 per metre	m^{-1}
density, mass density.	kilogram per cubic metre.	kg/m^3
current density	ampere per square metre.	A/m^2
magnetic field strength.	ampere per metre	A/m
concentration (of amount of substance).	mole per cubic metre	mol/m^3
specific volume	cubic metre per kilogram.	m^3/kg
luminance	candela per square metre.	cd/m^2

TABLE 4.—*Examples of SI derived units expressed by means of special names*

Quantity	Name	Unit symbol
dynamic viscosity	pascal second	$Pa \cdot s$
moment of force	metre newton	$N \cdot m$
surface tension	newton per metre	N/m
heat flux density, irradiance.	watt per square metre.	W/m^2
heat capacity, entropy.	joule per kelvin	J/K
specific heat capacity, specific entropy.	joule per kilogram kelvin.	$J/(kg \cdot K)$
specific energy	joule per kilogram	J/kg
thermal conductivity.	watt per metre kelvin.	$W/(m \cdot K)$
energy density	joule per cubic metre.	J/m^3
electric field strength.	volt per metre	V/m
electric charge density.	coulomb per cubic metre.	C/m^3
electric flux density.	coulomb per square metre.	C/m^2
permittivity	farad per metre	F/m
permeability	henry per metre	H/m
molar energy	joule per mole	J/mol
molar entropy, molar heat capacity.	joule per mole kelvin	$J/(mol \cdot K)$

For use with the SI units there is a set of 16 prefixes (see table 5) to form multiples and submultiples of these units.

TABLE 5.—*SI prefixes*

Factor	Prefix	Symbol
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10^{1}	deka	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a

Certain units which are not part of the SI are used so widely that it is impractical to abandon them. The units that are accepted for continued use in the United States with the International System are listed in table 6.

TABLE 6.—*Units in use with the international system*

Name	Symbol	Value in SI unit
minute	min	1 min = 60 s
hour	h	1 h = 60 min = 3 600 s
day	d	1 d = 24 h = 86 400 s
degree	°	1° = (π/180) rad
minute	′	1′ = (1/60)° = (π/10 800) rad
second	″	1″ = (1/60)′ = (π/648 000) rad
litre (liter) [1]	l	1 l = 1 dm^3 = 10^{-3} m^3
metric ton or tonne	t	1 t = 10^3 kg

[1] Both spellings are acceptable.

In those cases where their usage is already well established, the use, for a limited time, of the following units is accepted, subject to future review.

nautical mile	hectare	gal [1]
knot	barn	curie
angstrom	bar	rontgen
standard atmosphere	are	rad

[1] Not gallon.

Metric units and their symbols other than those enumerated above are not part of the International System of Units. Accordingly, the following units and terms listed in the table of metric units in section 2 of the act of July 28, 1866, that legalized the metric system of weights and measures in the United States, are no longer accepted for use in the United States:

myriameter
stere
millier or tonneau
quintal
myriagram
kilo (for kilogram)

For more information regarding the International System of Units, contact the Metric Information Office, National Bureau of Standards, U.S. Department of Commerce, Washington, D.C. 20234.

Dated: June 1, 1975.

RICHARD W. ROBERTS,
Director.

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Note: The kilogram is the only SI unit with a prefix. Because double prefixes are not to be used, the prefixes of Table 5, in the case of mass, are to be used with gram and not with kilogram.